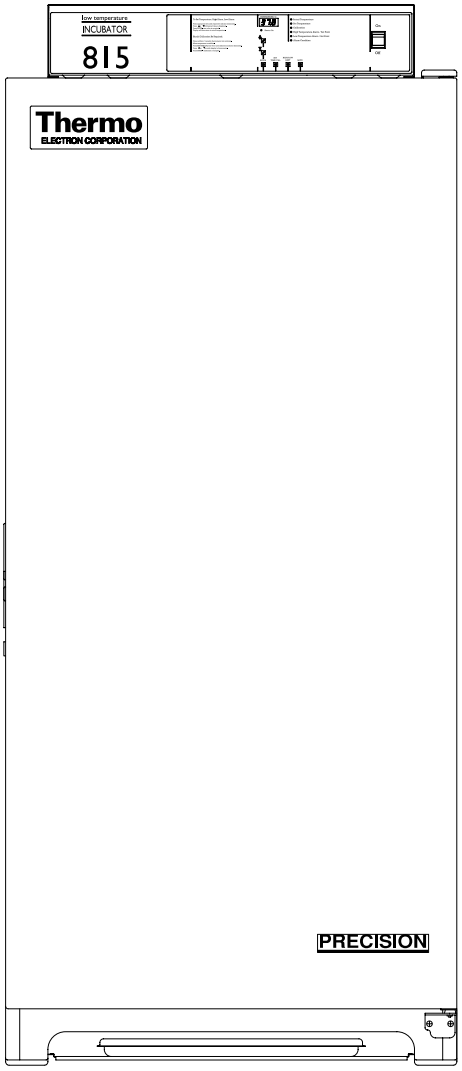
PRECISION

Installation/Service Manual

Microprocessor Controlled
Low Temperature Incubator
Model 815



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For repair information or replacement parts assistance from the manufacturer, call Customer Service using our toll free telephone number.

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REVISION STATUS

INDEX	DATE	AMENDED PAGES	NOTES
A	6/99		Initial Release
B	8/99	19	Update parts list for new kit #'s
C	9/01	18-20	Removed dual fans, updated parts list
D	12/04	18-20	Update for base model FFU2064DW1

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INTRODUCTION

Your satisfaction and safety are important to **PRECISION** and a complete understanding of this unit is necessary to attain these objectives.

As the user of this apparatus, you have the responsibility to understand the proper function and operational characteristics of your incubator. This instruction manual should be thoroughly read and all operators given adequate training before attempting to place this unit in service. Awareness of the stated cautions and warnings, and compliance with recommended operating parameters, together with maintenance requirements, are important for safe and satisfactory operation. The unit should be used for its intended application; alterations or modifications will **VOID THE WARRANTY.**

WARNING

AS A ROUTINE LABORATORY PRECAUTION, ALWAYS WEAR SAFETY GLASSES WHEN WORKING WITH THIS APPARATUS.

This product is not intended, nor can it be used, as a sterile or patient connected device. In addition, this apparatus is not designed for use in Class I, II or III locations as defined by the National Electrical Code.

UNPACKING AND DAMAGE

Save all packing material until unit is put into service. This merchandise was carefully packed and thoroughly inspected before leaving our factory.

Responsibility for safe delivery was assumed by the carrier upon acceptance of the shipment; therefore, claims for loss or damage sustained in transit must be made upon the carrier by the recipient as follows:

1. Visible Loss or Damage: Note any external evidence of loss or damage on the freight bill, or express receipt, and have it signed by the carrier's agent. Failure to adequately describe such external evidence of loss or damage may result in the carrier's refusing to honor your damage claim. The form required to file such claim will be supplied by the carrier.

2. Concealed Loss or Damage: Concealed loss or damage means loss or damage which does not become apparent until the merchandise has been unpacked and inspected. Should either occur, make a written request for inspection by carrier's agent within fifteen (15) days of the delivery date; then file a claim with the carrier since the damage is the carrier's responsibility.

If you follow the above instructions carefully, we will guarantee our full support of your claim to be compensated for loss or concealed damage.

DO NOT -- FOR ANY REASON -- RETURN THIS UNIT WITHOUT FIRST OBTAINING AUTHORIZATION. In any correspondence to **PRECISION,** please supply the nameplate data, including catalog number and serial number.

GENERAL INFORMATION

The incubator is commonly referred to as the standard Model 815. These instructions encompass the models listed below with their specific electrical characteristics.

MODEL 815			
Catalog	Volts	Hz	Amps
51221106 51221105	115 230	60 60	7.0 3.5

NOTE

CATALOG NO. 51220105 CAN BE CONVERTED FOR OPERATION ON 200V OR 240V BY CHANGING INPUT CONNECTIONS TO THE AUTOTRANSFORMERS (SEE WIRING DIAGRAM ON PAGE 17).

The 815 Low Temperature Incubator has been designed to provide the ultimate in temperature control. The user is assured of dependable and precise performance through the use of microprocessor technology in the temperature control circuitry. The Model 815 Incubator is operable in the range of -10° to 50°C. These temperature ranges will meet a wide variety of applications, such as BOD determination, general incubation and as well as the preservation of critical materials.

PERFORMANCE DATA

Heat-Up Time: From -10°C to 50°C; 120 minutes (Compressor "ON");

Cool-Down Time: From 50° to -10°C; 100 minutes.

MODEL 815		
Temperature Set Point °C	**Uniformity ±°C**	**Temperature Sensitivity**
-10.0	±0.9	±0.1C
20.0	±0.5	
37.0	±0.5	
50.0	±0.6	

NOTE

THE ABOVE PERFORMANCE FIGURES ARE BASED UPON THE FOLLOWING OPERATING CONDITIONS:
LINE VOLTAGE ..... 110.5 TO 112.5
AMBIENT TEMPERATURE ... 22.5° TO 24°C

Theory of Operation

The refrigeration system, defrost heater, and air circulating fan are used in conjunction with a microprocessor controlled proportioning circuit to achieve sensitive temperature control. A RTD (Resistance Temperature Detector) located in the airstream senses any temperature deviation from the control point, and heat is provided proportionally to maintain the desired temperature. Regardless of what temperature is being maintained, the compressor operates continuously. This constant operation alleviates component failures associated with cycle type operation.

The circulating fan provides even air distribution throughout the chamber and assures temperature uniformity.

EXPLANATION OF CONTROLS
-Front Panel-

1) HEATER ON LAMP - The "Heater On" lamp is illuminated when power is applied to the heater.

2) LED DISPLAY - Four digits are used to display the actual, set, calibrate, high limit and low limit values.

3) INDICATOR LAMPS - There are five (5) green indicator lamps that are used to inform the user which parameter the display is indicating. The sixth indicator is for a high or low temperature alarm condition. An internal audible alarm will also operate when this alarm indicator illuminates.

4) ON/OFF SWITCH - The On/Off switch provides the main power to the incubator.

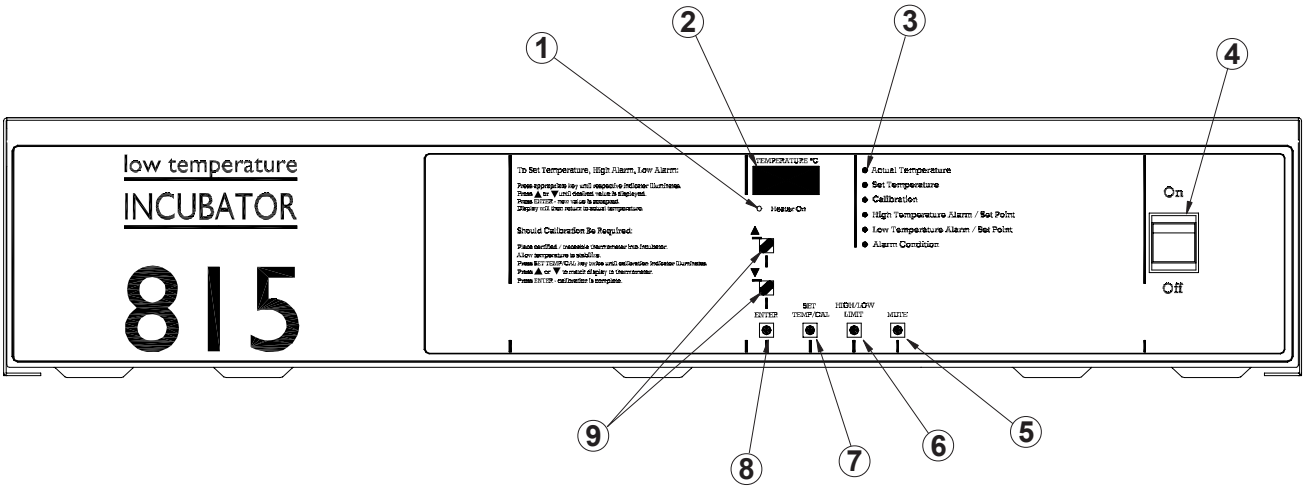
5) MUTE KEY - This key is used to silence the internal audible alarm and to also de-activate the external alarm device if one is being used.

6) HIGH/LOW LIMIT KEY - This key is used to view the high or low temperature alarm setpoint The first depression of the key selects the high limit. The second depression selects the low limit. The respective green indicator lamp will light.

7) SET TEMP/CAL KEY - This key is used to view the operating setpoint temperature or calibrate the unit to a certified/traceable thermometer. The first depression of the key selects the operating setpoint and the second depression selects the calibration mode. The respective green indicator lamp will light.

8) ENTER KEY - This key is used after any setpoint selection is made to enter the value into memory.

9) UP/DOWN ARROW KEYS - These keys are used to increase or decrease the desired setpoint value.

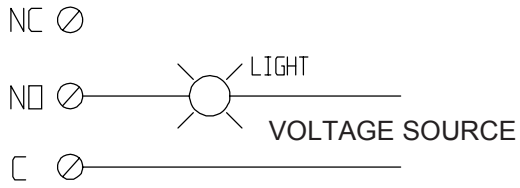


-Explanation of Auxiliary Panel-

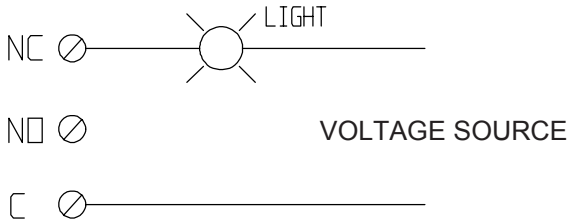
On the left side of the incubator control panel there is an auxiliary panel which has the items shown in the figure below. They are described as follows:

1) FUSE - This fuse is in line with the main power cord that comes into the incubator. The rating of this fuse is printed above the fuse holder. The physical size of this fuse is 5 MM x 20 MM.

2) ALARM RELAY - This Alarm Relay output is provided to the user for the purpose of remotely monitoring the incubator in case of a high or low temperature alarm condition. This alarm relay will operate just as the audible alarm would. The contact itself is an isolated form C (normally open/ normally closed) dry contact. This contact is to be used for low voltage class 2 connections only. The contact rating is 24 volts, 1.25 amps resistive. Typical usages of the output are shown below.



In this configuration, the light will illuminate whenever the unit goes into an alarm condition...High or Low.



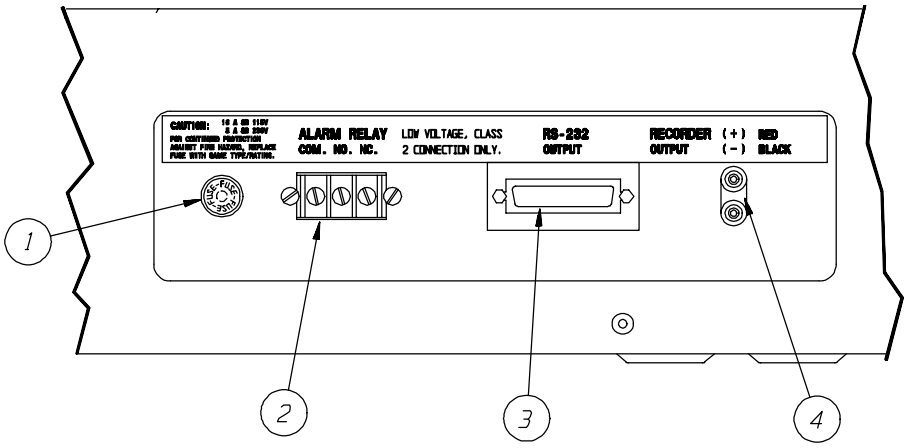
In this configuration, the light will go off in a high or low temperature alarm condition.

NOTE

WIRING MUST CONFORM TO ALL LOCAL ELECTRICAL CODES.

3) RS-232 OUTPUT (Optional Kit P/N 51200906) - This output is used for two way communications between the incubator and a personal computer. With the use of communications/modem software program, the user can record the temperature of the incubator at their selected time periods and store it in a file for use with a spreadsheet program. The user can also change the setpoint temperature from their personal computer and periodically monitor the actual temperature, setpoint temperature, and alarm status.

4) RECORDER OUTPUT - This is a DC millivolt output which represents the temperature of the incubator. The recommended main use of this is with a chart recorder having an input impedance of at least 1 megohm. The scaled temperature output change is 10 millivolt/degree C. When the incubator is operating at a negative temperature, the chart recorder output is still positive. Use the chart below to relate temperature to output voltage.



Temperature (Degree C)	Recorder Output (Millivolts)
-10	100
0	200
10	300
20	400
30	500
40	600
50	700

Located on the chart recorder printed circuit board is an offset potentiometer R3. If for some reason the recorder output voltage does not match the temperature as shown in the chart, this potentiometer can be used to tune it in.

When connecting a chart recorder to the recorder output connector, it is recommended to use a shielded cable with the shield grounded at the chart recorder and to keep the cable short as possible.

INSTRUMENTATION PORT

Located on the rear side of the incubator is an instrumentation port for the user to insert sensor wires, external meter leads, etc. into the chamber. The rubber plug provided must always be used in this port to insure the uniformity specifications. An extra plug is supplied for the user's convenience. Be sure to seal any gaps around the wire(s) going through the plug.

INSTALLATION

Location

To assure proper ventilation, allow a minimum of 4" of clearance between the rear, top, and sides of the incubator and adjacent walls. If two or more incubators are positioned side by side, allow a minimum of 8" between cabinets. Adjust the front leveling feet of the incubator so that the front is higher than the rear. This will assist in door closing. Choose a site free from rapidly changing ambient temperature conditions.

CAUTION

THE INCUBATOR SHOULD NOT BE OPERATED IN AN ENVIRONMENT WHERE THE AMBIENT TEMPERATURE EXCEEDS 90°F, AS THE COMPRESSOR THERMO-OVERLOAD WILL BE TRIPPED AND WILL RESULT IN A WIDE BAND CONTROL CYCLE OF APPROXIMATELY ±4°C. SUCH CYCLING SHOULD NOT BE MISINTERPRETED AS A MALFUNCTION OF THE ELECTRONIC CONTROLS.

Radiators, air-conditioning outlets, other ventilating system outlets, and drafts can affect the operation of the incubator by a sudden inrush of air that is at a temperature different than operating conditions.

WARNING

FOR PERSONAL SAFETY, THIS APPARATUS MUST BE PROPERLY GROUNDED.

The power cord of this instrument is equipped with a three-prong (grounding) plug which mates with a standard three-prong (grounding) wall receptacle to minimize the possibility of electric shock hazard from this apparatus. The customer should have the wall receptacle and circuit checked by a qualified electrician to make sure the receptacle is properly grounded.

Where a two-prong wall receptacle is encountered, it is the personal responsibility and obligation of the user to have it replaced with a properly grounded three-prong wall receptacle.

WARNING

DO NOT -- UNDER ANY CIRCUMSTANCES, CUT OR REMOVE THE THIRD (GROUND) PRONG FROM THE POWER CORD. DO NOT USE A TWO-PRONG ADAPTER PLUG.

Determine the total amount of current presently being used by other apparatus connected to the circuit that will be used for this unit.
It is critical that the added current demand and other equipment on the circuit not exceed the rating of the fuse or circuit breaker in use.

CAUTION

BE SURE THAT THE POWER SUPPLY IS OF THE SAME VOLTAGE AS SPECIFIED ON THE NAMEPLATE.

When loading the incubator, a space of 1/2" must be allowed between adjacent items. This will allow maximum air circulation, which is necessary for proper temperature uniformity. The uniformity will be adversely affected if air circulation is obstructed.

Liquid containers should never be placed in the incubator without covers. The evaporation of moisture within the chamber will only add frost and hasten the need for defrosting. This chamber is not self-defrosting.

Excessive frost buildup on the evaporator coil located on the lower rear wall will also affect temperature uniformity.

WARNING

SAFETY PRECAUTIONS

1. *DO NOT PLACE ANY EXPLOSIVE, COMBUSTIBLE, OR FLAMMABLE MATERIALS IN THE CHAMBER.*
2. *DO NOT PLACE SEALED CONTAINERS IN THE CHAMBER. SEALED CONTAINERS, FILLED WITH MATERIALS DO NOT PROVIDE ROOM FOR EXPANSION AND CAN DEVELOP DANGEROUS VAPOR PRESSURE AS THE TEMPERATURE INCREASES.*
3. *AVOID SPILLAGE OF LIQUIDS WITHIN THE CHAMBER.*
4. *DO NOT EVAPORATE NOXIOUS FUMES.*

CAUTION

DO NOT STORE CONTAINERS FILLED WITH ACIDIC OR CAUSTIC SOLUTIONS, AS VAPORS FROM THESE MATERIALS WILL ATTACK THE EVAPORATOR AND VOID THE WARRANTY.

OPERATION

Power up by depressing the ON/OFF switch. Immediately after turning on power, all the segments of the display and all of the indicators will be on. After one second the display will show the actual temperature and the actual temperature indicator light will be lit. If the setpoint temperature is greater than the actual temperature, then the heater on lamp will be on or start to flash. If it flashes, then the actual temperature is near setpoint temperature.

To display any TEMPERATURE VALUE - With the use of either the SET TEMP/CAL key or the HIGH/ LOW LIMIT key, any temperature value can be displayed. To view the set temperature, press the SET TEMP/CAL key once. The green indicator for the set temperature will light. If no other keys are pressed, within 5 seconds, the display will automatically return to the actual temperature. To view the calibrate temperature, press the SET TEMP/CAL twice while the display is showing the actual temperature. The same sequence of key operation is true for the use of the HIGH/LOW LIMIT key.

To change the SETPOINT TEMPERATURE - Press the SET TEMP/CAL key once. Then press the UP or DOWN arrow key until the desired temperature is displayed. When continuously pressing either the UP or DOWN keys, the display will begin to change rapidly. With a little practice, one will become accustomed to this. After the desired set temperature is achieved, then press the ENTER key. The display will then return to showing the actual temperature. If the ENTER key is not pressed, the expected new set temperature will not be accepted and the incubator will control at the previous set temperature.

To CALIBRATE the INCUBATOR - The incubator is calibrated at the factory for use over a wide range of temperatures. Due to the slight non-linearities in the control system, it may be necessary to make the display match a calibrated thermometer's reading, even though the difference might be only a few tenth's of a degree.

The CALIBRATE key should be used ONLY to match a stable incubator's actual temperature to the calibrated thermometer.

Place a calibrated thermometer or the probe of one at the center of the third shelf of the incubator. Select the SETPOINT you wish to run the unit at. Allow the unit to run for at least an hour after it reaches the setpoint, before you perform the calibration.

NOTE

IF POSSIBLE PLACE THE THERMOMETER INTO A LIQUID FOR STABILITY.

To perform calibration, press the SET TEMP/CAL twice. The green calibration indicator should be lit. Then press either the UP or DOWN arrow keys to make the display match the noted thermometer reading. After the satisfied display is achieved, press the ENTER key. The display will then return to showing the newly calibrated actual temperature.

To change the HIGH TEMPERATURE ALARM SETPOINT - After selecting a setpoint temperature, the HIGH TEMPERATURE ALARM SETPOINT automatically defaults to 1° higher than the setpoint that was entered. This 1° default difference can be overridden if the user wishes to. The following paragraph describes this.

Press the HIGH/LOW LIMIT key once. The green "High Temperature alarm/Set Point" indicator should be lit. Use the UP or DOWN arrow keys to select your limit value. Then press the ENTER key. If the HIGH LIMIT value you have selected is below the operating SETPOINT TEMPERATURE, the incubators' alarm will activate

To change the LOW TEMPERATURE ALARM/ SETPOINT - After selecting a setpoint temperature, the LOW TEMPERATURE SETPOINT automatically defaults to 1° lower than the setpoint that was entered. This 1° default difference can be overridden if the user wishes to. The next paragraph describes this.

Press the HIGH/LOW LIMIT key twice. The green "Low Temperature Alarm/Setpoint" indicator should be lit. Use the UP or DOWN arrow keys to select your limit value. Then press the ENTER key. If the LOW LIMIT value you have selected is above the operating setpoint temperature, the incubators' alarm will activate.

NOTE

SOFTWARE VERSION 2.00 HAS A 30-MINUTE DELAY FOR THE LOW AND HIGH ALARM TO AVOID NUISANCE ALARMS CAUSED BY DOOR OPENINGS.

SERVICING

WARNING

SERVICE SHOULD BE PERFORMED ONLY BY QUALIFIED SERVICE PERSONNEL. EXERCISE CARE AS LINE VOLTAGE IS PRESENT IN THE CONTROL COMPARTMENT.

If it is ascertained, after review of the Troubleshooting Section, that refrigeration service is needed, contact the White-Westinghouse Service Organization.

In any communication with White-Westinghouse or Precision, include the model and serial numbers from both nameplates located near the bottom of the door opening. Specific reference must be made to White-Westinghouse Policy Procedure Letter 82-2605, which covers the service requirements for this particular model.

For assistance in locating the nearest White-Westinghouse authorized service or parts supplier, contact:

White-Westinghouse
P.O. Box 7181
Dublin, OH 43017
1(800) 245-0600

TROUBLESHOOTING

Problems encountered with any constant temperature chamber will most frequently be related to temperature control. Before proceeding with detailed troubleshooting, be certain that the Low Limit and High Limit controls are adjusted properly. If the limit controls are set too close or beyond the operating temperature, the incubator may be consistently going into alarm. This will result in erratic temperature control. First, the symptoms and possible causes will be listed for quick reference. Later, the remedies will be suggested.

WARNING

HAZARDOUS HIGH VOLTAGE CONDITIONS EXIST INSIDE THE CONTROL PANEL. UNPLUG LINE CORD AND TURN "OFF" LINE SWITCH BEFORE REMOVING THE COVER. ONLY QUALIFIED ELECTRICAL INSTRUMENT PERSONNEL ARE AUTHORIZED TO PERFORM TROUBLESHOOTING AND/OR SERVICING.

SYMPTOMS AND POSSIBLE CAUSES:

Freeze-up or gradual drop in chamber temperature:

No air circulation in chamber; inoperative fan (see Remedy 1)
Heater (see Remedy 2)
Power Supply PCB Assembly (see Remedy 3)
RTD Temperature Probe (see Remedy 3, Step D and/or Remedy 4).

Temperature variations at set point (poor control):

Excessive ambient temperature variations (see Remedy 10)
Compressor Relay failure (see Remedy 12)
No air circulation in chamber; inoperative fan (see Remedy 1)
RTD Temperature Probe Location (see Remedy 5)
Ice buildup on evaporator coils (see paragraph on "Defrosting")
RTD Temperature probe (see Remedy 3, Step D and/or Remedy 4).
Power Supply PCB Assembly (see Remedy 3)

Does not reach a high set point temperature:

No air circulation in chamber; inoperative fan (see Remedy 1)
Low line voltage, less than 110V (see Remedy 9)
RTD Temperature Probe (see Remedy 3, Step D and/or Remedy 4).
Power Supply PCB Assembly (see Remedy 3)
Overcharged compressor (see Remedy 11)

Differences between Temperature Set and Digital Temperature Readout: (see performance figures, page 3)

RTD Temperature Probe (see Remedy 3, Step D and/or Remedy 4).
Malfunctioning Power Supply PCB assembly (see Remedy 3)

Takes an extremely long time to reach high temperature set point:

No air circulation in chamber; inoperative fan (see Remedy 1)
Low line voltage, less than 110V (see Remedy 9)
Power Supply PCB assembly (see Remedy 3)
Overcharged Compressor (see Remedy 11)

Display indicates nnnn **or** uuuu
Malfunctioning RTD Temperature Probe (Remedy 4)

POSSIBLE REMEDIES:

1. Inoperative Fan:
   Open the door. Place your hand near the grill at the top rear of the chamber and check for air circulation. If there is no air circulation, the fan motor is malfunctioning. Contact White Westinghouse for replacement part. See page 8.

2. Burned-out heater:
   To check this, the control panel cover must be removed.

WARNING

HAZARDOUS HIGH VOLTAGE CONDITIONS EXIST INSIDE CONTROL PANEL. TURN "OFF" LINE SWITCH ON FRONT PANEL AND UNPLUG LINE CORD.

Remove all screws that fasten the cover. Locate nylon connector J1 on the Limit/Alarm PCB Assembly. Depress both ears on the plug housing and gently pull out the connector.

With an Ohmmeter, measure the resistance between TB1-4 (Orange wire) and TB1-6 (Red wire).

The proper heater resistance is 24 ohms. If heater resistance is correct, then measure between one heater lead (RED or ORANGE) and incubator ground, it must be infinity (Open). If the heater resistance check indicates an open circuit, it may or may not be open. In series with the heater is a thermal overload switch. It might be that this thermal overload is open and not the heater. To check the heater and thermal switch directly, the shelfs of the incubator and the back wall cover must be removed. Unplug heater and measure its' resistance. If the resistance is correct, check resistance between heater terminal and the heater sheath. It must be an open circuit. If the heater is good, then check the thermal overload switch. At room temperature it should be closed (0 ohms). This switch should only open at 80°C and then close at 65°C. If the heater and thermal switch are good, then the problem is directed towards the heater wires in the harness. If heater is defective, contact White-Westinghouse for replacement heater. See page 7.

3. Malfunctioning Power Supply PCB assembly:

   The Power Supply PCB Assembly has the triac (solid state AC voltage switch) on it which supplies the power to heater. This triac is "told" to operate, when need be, by the microprocessor.

There is another device known as an Optoisolator which serves as the high/low voltage isolator between the triac and the microprocessor.

When the incubator starts experiencing temperature problems and/or variations, due to known controller malfunctions, these two components become prime suspects. The reason being they are under higher operating stress than other components.

If the incubator starts experiencing temperature problems such as no heat, constant heat, or "creeping" upward heat, then follow the troubleshooting instructions below. These instructions require the use of a voltmeter being able to measure DC and AC voltages and preferably a digital voltmeter.

WARNING

THE FOLLOWING TROUBLESHOOTING INSTRUCTIONS REQUIRE THAT POWER BE ON. ONLY QUALIFIED SERVICE PERSONNEL SHOULD PERFORM THESE PROCEDURES.

A) Remove the control cover and familiarize yourself with the power supply assembly #34394901. Locate the Triac (Q2), the Opto-isolator (U1), resistor (R4). Also locate the test point #2 (TP2). The first measurements will be DC voltage measurement, so a DC scale of at least 10 volts should be selected. Connect the negative lead to TP2. This is DC ground. Also locate the terminal block (TB1).

B) This first section will be to verify the heater command is correct from the microprocessor, through the optoisolator, and through the Triac when the incubator is NOT requesting heat. The steps in this section must be followed in progression.

-Select a setpoint temperature at least 10° below what the actual temperature is. The incubator should not be requesting heat as indicated by the "Heater On" indicator lamp on the front panel. It should not be on continuously or even flashing.

-Measure the voltage at U1-Pin 2 with respect to TP2. It should be no less than 4 volts DC.
-Measure the DC voltage across R4, since the incubator is not requesting heat, there should be no current flowing through this resistor, making the voltage drop equal to zero volts.
If the last two steps are not as stated, then most likely the CPU board is bad and it will have to be replaced.

-Switch the voltmeter to an "AC Volts" scale capable of reading 120 volts.

-Measure the voltage between U1-Pin 4 and U1-Pin 6. It should be line voltage. 110 VAC to 120 VAC.

If it is not, most likely the Optoisolator is bad and the power supply board will have to be replaced.

-Measure the voltage TB1-4 (Orange wire) and TB1-6 (Red wire). It should be approximately 0 VAC.

If it is not, then most likely the triac is bad, and the power supply board will have to be replaced.

C) This second section will be to verify the heater command is correct from the microprocessor, through the optoisolator, and through the Triac when the incubator is requesting heat. The steps in this section must be followed in progression.

-Select a setpoint temperature at least 10° above what the actual temperature is. The incubator should be requesting heat as indicated by the "Heater On" indicator lamp on the front panel. It should be on continuously, not flashing.

-Measure the voltage at U1-Pin 2 with respect to TP2. It should be no greater than 4 volts DC.

-Measure the DC voltage across R4, since the incubator is requesting heat, there should be current flowing through this resistor, making the voltage drop equal to 3 volts ±0.5 volts.

If the last two steps are not as stated then most likely the CPU board is bad and it will have to be replaced.

-Switch the voltmeter to an "AC Volts" scale capable of reading 120 Volts.

-Measure the voltage between U1-Pin 4 and U1-Pin 6. It should be less than 1 VAC.
If it is not, most likely the optoisolator is bad and the power supply board will have to be replaced.

-Measure the voltage between TB1-4 (Orange wire) and TB1-6 (Red wire). It should be line voltage. 110 VAC to 120 VAC.

If it is not, then most likely the triac is bad. The power supply board will have to be replaced.

D) Measure RTD temperature probe resistance at the connector after unplugging it from plug J302. The resistance between contacts, at various temperatures are as follows:

TEMPERATURE	RESISTANCE
0°C	100 OHMS
20°C	108 OHMS
37°C	114 OHMS
50°C	119 OHMS

NOTE

ONLY 2 OF THE 3 CONNECTORS POSITIONS ARE USED.

4. Malfunctioning RTD Temperature probe:
The Control Board can detect if the temperature probe or the connection of the temperature probe to the circuit board is "OPEN" or "SHORTED". These two conditions are shown on the display as follows:

DISPLAY	CONDITION
nnnn	OPEN CIRCUIT
uuuu	SHORT CIRCUIT

Before coming to the conclusion that the probe is bad when one of these displays appear, check the connection of the probe to the circuit board.

5. RTD Temperature Sensor Probe Location:
The Proper RTD location is important. The RTD is supported by the stainless steel bracket attached on the rear wall and near the top of the chamber. Two tube shaped clips securely support the RTD probe into place. The RTD must be inserted fully into its support bracket.

6. Constantly Experiencing Low temperature Alarm:
If the incubator is constantly going into low temperature alarm, then most likely the setpoint temperature setting is too close to the low temperature alarm/setpoint setting. The setpoint temperature setting should be a minimum of 2° above the low temperature alarm setting. If the problem persists, then see Remedy 3.

7. Constantly experiencing high temperature alarm:
If the incubator is constantly going into high temperature alarm, then most likely the setpoint temperature setting is too close to the high temperature alarm/setpoint setting. The setpoint temperature setting should be a minimum of 2° below the high temperature alarm setting. If the problem persists, then see Remedy 3.

NOTE

SOFTWARE VERSION 2.00 HAS A 30-MINUTE DELAY FOR THE LOW AND HIGH ALARM TO AVOID NUISANCE ALARMS CAUSED BY DOOR OPENINGS.

8. Ice buildup on evaporator coils:
Excessive frost buildup is the result of the introduction of outside moisture. This may be caused by the evaporation of liquids placed in the chamber, or it may be the result of excessive opening of the door during high humidity conditions. The door gasket should also be examined for proper seal; if repairs

are necessary, contact White-Westinghouse or adjust door hinges. See page 8.

9. Excessive line voltage variation:
   Incubator will operate satisfactorily over full temperature range (-10°C to 50°C) when line voltages vary from nominal voltage by -5% or +10%. Larger voltage variations may impair the Temperature Control. Correct as required.

10. Excessive ambient temperature variation:
    If the incubator is placed close to the air-conditioning outlet, hot radiators, or direct sunlight, or if the ambient temperature changes drastically, the chamber temperature will be affected. Correct as necessary.

CAUTION

THE INCUBATOR SHOULD NOT BE OPERATED IN AN ENVIRONMENT WHERE THE AMBIENT TEMPERATURE EXCEEDS 90°F, AS THE COMPRESSOR THERMO-OVERLOAD WILL BE TRIPPED AND WILL RESULT IN A WIDE BAND CONTROL CYCLE OF APPROXIMATELY ±4°C. SUCH CYCLING SHOULD NOT BE MISINTERPRETED AS A MALFUNCTION OF THE ELECTRONIC CONTROLS.

11. Overcharged compressor:
    This would happen only if compressor was overcharged after installation.
    For correct charge, see nameplate located behind lower portion of door. If unit has more charge than shown, it will not reach 50°C. Compressor must be discharged and recharged correctly.

12. The circuit design calls for continuous compressor operation. If compressor cycles "On-Off", it is an indication that the starting relay is overriding the control circuit. This may be the result of excessive (90°F) ambient temperature adjacent to the compressor, excess dirt on the compressor, or a relay malfunction. Provide additional wall clearance and/or circulation around the unit, clean compressor, or contact White-Westinghouse for service. See page 8.

MAINTENANCE

The design of the incubator is such that periodic maintenance is kept to a minimum. No lubrication is required. The following paragraphs cover the few minor procedures necessary for continuous operation.

WARNING

TURN OFF POWER SWITCH AND UNPLUG LINE CORD TO INCUBATOR.

If the chamber needs to be cleaned, a mild soap and water solution or bicarbonate of soda (1tbsp./gallon of water) is recommended.

When the incubator is used frequently below ambient temperatures or in any manner that increases moisture buildup within the chamber, an appropriate defrosting schedule must be determined. Defrosting is accomplished by turning the incubator off for 24 hours. Moisture will collect in the drip pan beneath the incubator.

WARNING

1) *OVERCHARGING A REFRIGERATION SYSTEM CAN CAUSE EXCESSIVE SYSTEM PRESSURE AND IT CAN BE DANGEROUS.*
2) *THE COMPRESSOR TERMINAL PROTECTIVE COVER MUST BE PROPERLY IN PLACE BEFORE APPLYING ELECTRIC POWER TO THE COMPRESSOR.*
3) *CAUTION SHOULD BE EXERCISED BY SERVICE PERSONNEL WHEN SERVICING REFRIGERATION SYSTEM.*
4) *SERVICE SHOULD BE PERFORMED BY A CERTIFIED REFRIGERATION TECHNICIAN ONLY.*

INSTALLATION AND OPERATION OF THE RS232 OPTION

1. Remove the eight (8) screws securing the control panel. There are four (4) on the top and 2 on each of the sides. Then remove the cover by sliding it towards the front of the incubator.

2. Slide open the auxiliary panel door and locate the mounting area of the RS232 board as shown on page 4.

3. Mount the RS232 printed circuit board assembly using the screws or standoffs provided. See Figure below.

4. Connect one end of the cable to J304 located on the left edge of the left printed circuit board (p/n 34381002). **Be careful of alignment.**

5. Connect the other end of the cable to the cable connector on the RS232 PCB assembly (see sketch).

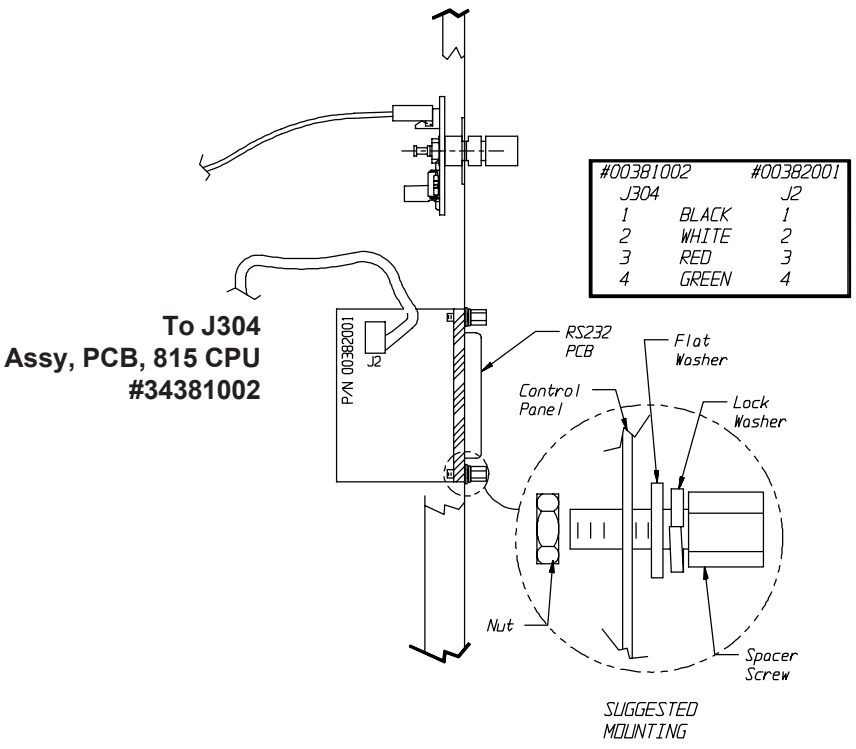
6. Replace the control panel and secure with the eight (8) screws.

The RS232 PCB provides a bi-directional communication port that will allow the user to monitor the performance or the change the operating valves of the incubator from a remote computer. RS232 Communication will require a communication program such as a modem program installed in your computer which will allow the storage of data within your files.

The RS232 PCB utilizes one of the users computer serial ports, such as COM1 or COM2. The communication software must be configured to the selected port. The serial port is an IBM PC AT-style port. The cable that connects to it must end in a DB-25 (25-pin) male connector. The cable is a one-to-one wiring format. The pin assignments for the serial port are:

PIN	SIGNAL	DESCRIPTION
2	TXD	Serial Transmitted Data
3	RXD	Serial Received Data
7	GND	Signal Ground (O V)

TOP VIEW OF CONTROL PANEL



Setting up the Incubator for Communications

Your Incubator will require the selection of 3 parameters for communications:

A) Baud Rate - This is the speed of communication between the incubator and computer. Whatever is selected for the incubator must also be selected in the communication software that is planned to be used.

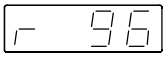
B) Status Update Time Interval - This is the time between information being sent from the incubator to the computer.

C) Status Display Type - Selection of format of data that is sent to your computer.

Please read the following steps before performing any of them. It will allow you to familiarize yourself with the procedure and to determine the values you want beforehand.

Please note: *In the following setup mode there is a five (5) second time out feature that is active following each entry. If the five (5) seconds has been exceeded, the unit will return to the normal operation mode. If the time out occurs before the value was entered, start over.*

1. With the incubator ON, simultaneously press and hold the UP and DOWN keys, then press the ENTER key. The letters will be shown in the display. A number other than 96 might be shown in the display:



Choose the number appropriate for the Baud Rate desired.

3 = 300
6 = 600
12 = 1200
24 = 2400
48 = 4800
96 = 9600

Press the UP or DOWN key until the display reads your selection. Press ENTER. The baud rate has been entered.

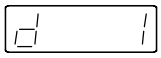
2. The display should change to the following. Again, the number in the display might be different than 0.1, but it will have a decimal point.

Choose the number appropriate for the Status Update Time Interval desired.

0.0 Minutes	No report
0.1 Minutes	Between reports
0.5 Minutes	Between reports
1.0 Minutes	Between reports
2.0 Minutes	Between reports
5.0 Minutes	Between reports
10.0 Minutes	Between reports
30.0 Minutes	Between reports
60.0 Minutes	Between reports

Press the UP or DOWN key until the setpoint display reads your selection. Press ENTER. The value is entered.

3. The display should have changed to the following. Again, the number in the display might be different than 1. This selection is for Status Display Type.



Listed are the numbered selections with explanations and examples of the values displayed on your computer's monitor when the incubator transmits information.

0 = Used for a raw, one-line status output suitable for importing into a spreadsheet.
1 = Used for a multi-line format with English headings with continuous screen.
2 = Used for the format as "1" but preceded by a clear screen command used by terminals or computers running terminal software. This mode overwrites the previous transmission.

With Status Display Type = 0:

10 -5.0 0

Where:

10 = Actual Temperature
-5.0 = Setpoint Temperature
0 = Normal

With Status Display Type = 1 or 2:

Actual Temperature: 10
Setpoint Temperature: -5.0
Alarm Status: Normal
LOW
HIGH

4. Allow the setup to time out.

The incubator is now ready to communicate with your computer.

Setting up the computer:

Your communications software will most likely have a setup routine to set the parameters listed below. These are the values the incubator is using, so you must match your computers software parameters accordingly. Also, you will probably have to select the "COM" serial port you chose when you connected the cable from your computer to the incubator. The software may ask what format the data is in. You should choose "ASCII".

Parameter	Settings
Baud Rate:	Baud Rate value selected earlier in Step 1.
Parity:	None (0)
Data Bits:	Eight (8)
Stop Bits:	One (1)
COM Port:	Selected by user
Format:	ASCII

Using the Communications:

The incubator transmits information on its RS232 Port as long as the status update time interval is not "0.0."

If you start your communication software with the incubator on, most likely you will see the error(s) messages as follows:

ERR
? VALUE IS READ ONLY
? ILLEGAL COMMAND

Wait for the Status Update Time duration you selected to complete, and the communications will correct itself.

Besides having the incubator transmit information in one of the three formats, the user can monitor other values or even change some of these from their computer.

The following table lists the available commands for monitoring or controlling your unit.

View Command:	Description:	Unit:	Range:	Change Command
A?	Actual Temperature	Degrees	-10 to 50	Read Only
T?	Setpoint Temperature	Degrees	-10 to 50	T10 thru T50
R?	Baud Rate	-	0 - 5	R0 thru R5
S?	Status Update Time	-	0 - 8	S0 thru S8
V?	EPROM Version Number	-	Current Rev.	Read Only
D?	Status Display Type	-	0 - 2	D0 thru D2
O?	Display the Alarm Status	-	0 - 2	Read Only

To View Data: If Status Update Time is "0.0" no data will automatically be displayed. To view data within a particular command code, type that command code followed by the question mark (?) symbol and then ENTER (Return).

Example: To view Setpoint Temperature type:
T? <CR>

To Change Data: To change the value within the command type the command code followed by the new value and ENTER (Return).

Example 1: To change Setpoint Temperature to 25.0°C type:

T25.0 <CR>

Example 2: To change Setpoint Temperature to -.8°C type:

T-.8<CR>

(A) **Actual Temperature:** The actual temperature within the incubator.

(T) **Setpoint Temperature**: The temperature at which the user has selected the incubator to operate.

(R) **Baud Rate**: The rate at which data is transmitted between the incubator and your computer

0 = 300 Baud
1 = 600 Baud
2 = 1200 Baud
3 = 2400 Baud
4 = 4800 Baud
5 = 9600 Baud

(S) **Status Update Time Interval**: The time between data messages sent from the incubator to your computer

0 = 0 Minutes, No report
1 = 0.1 Minutes (6 seconds)
2 = 0.5 Minutes (30 seconds)
3 = 1.0 Minutes
4 = 2.0 Minutes
5 = 5.0 Minutes
6 = 10.0 Minutes
7 = 30.0 Minutes
8 = 60.0 Minutes

(V) **EPROM Version Number**: The incubator software version level.

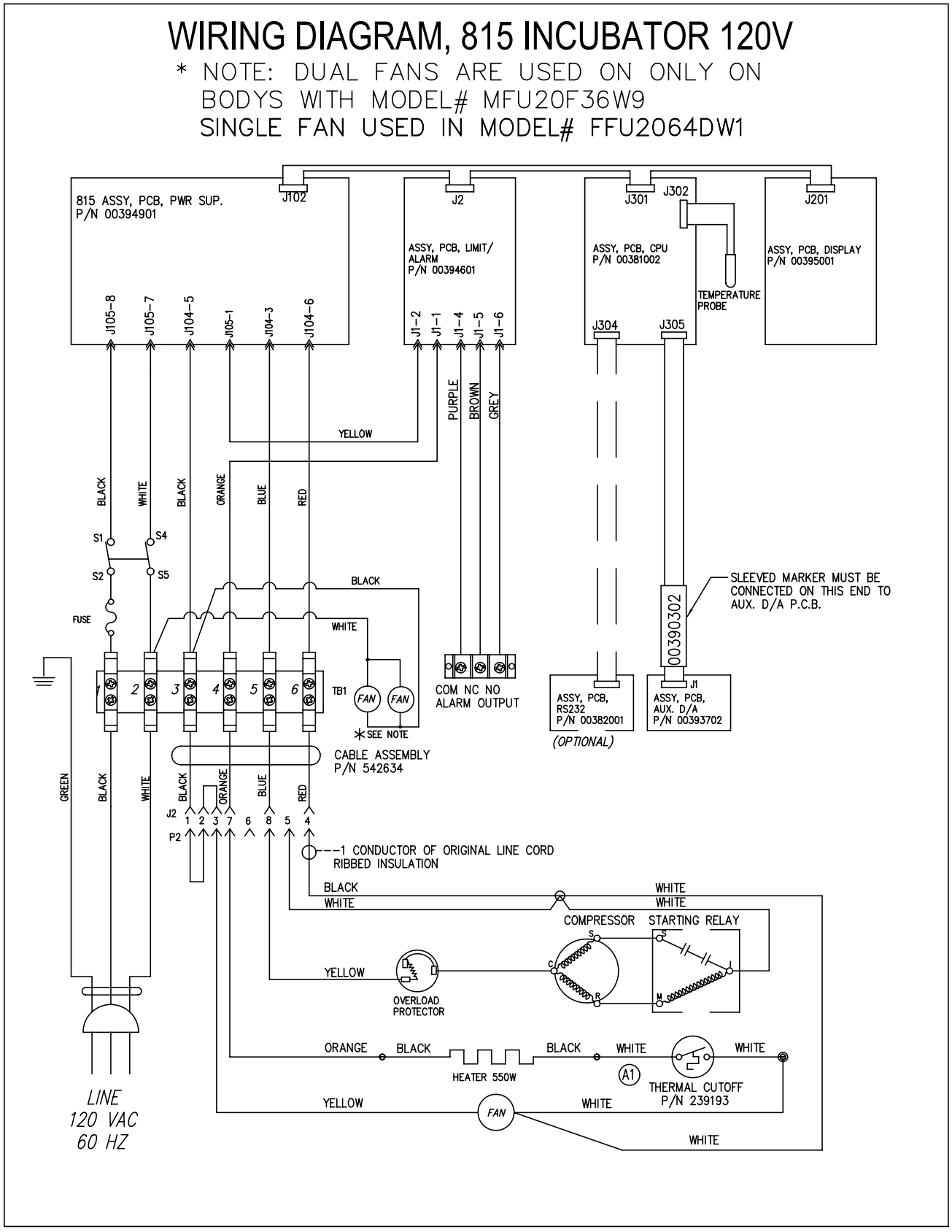
(D) **Status Display Type:** Selection of format that data is sent to your computer

0 = Used for a raw, one-line status output suitable for importing into a spreadsheet
1 = Used for a multi-line format with English headings
2 = Used for the format as “1” but preceded by a clear screen command used by terminals or computers running terminal software.

(O) **Display the Alarm Status:** The alarm has thee (3) possible values:

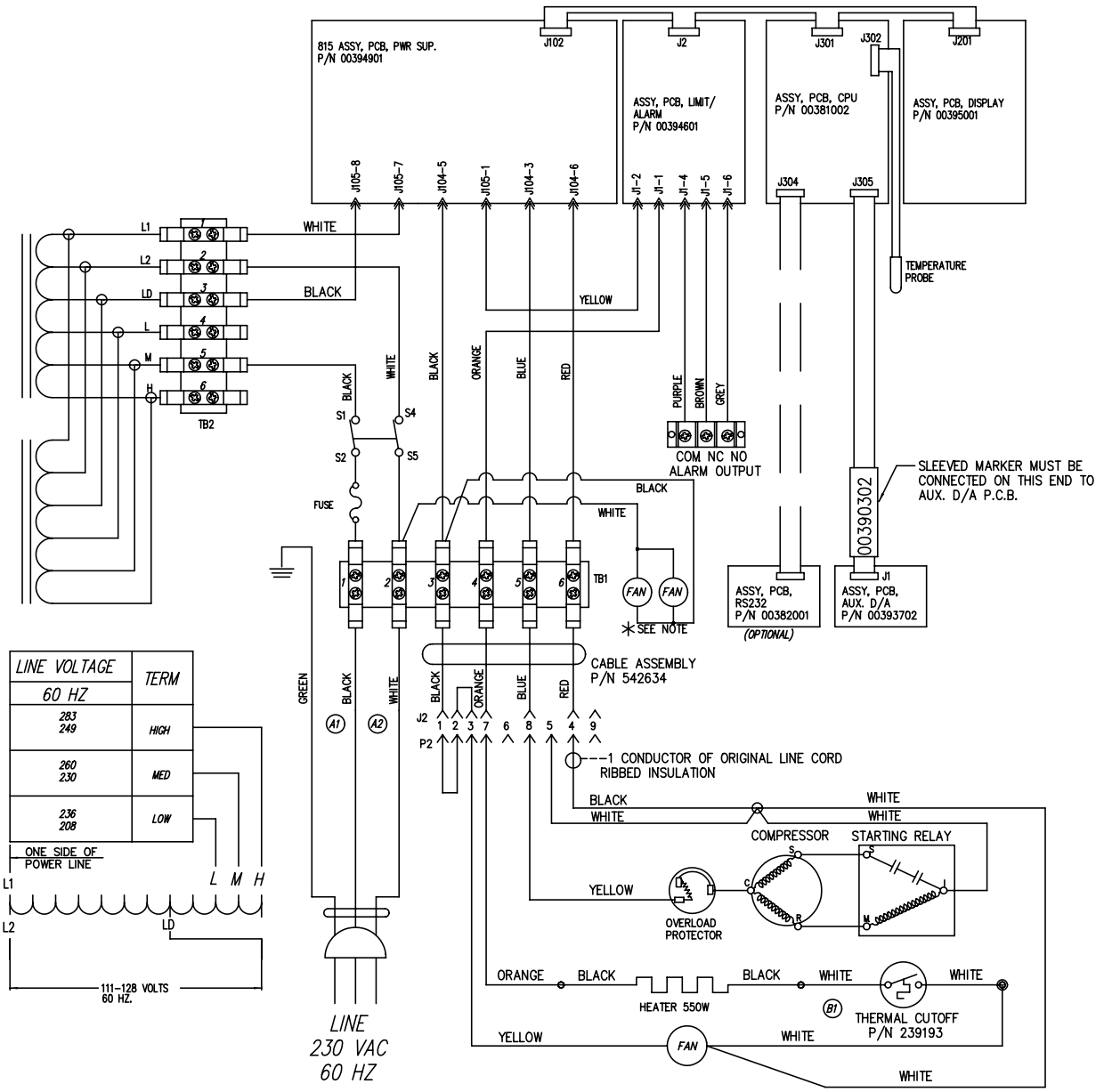
0 = Normal, no alarms
1 = Low alarm
2 = High alarm

WIRING DIAGRAMS



WIRING DIAGRAM, 815 INCUBATOR 230V

* NOTE: DUAL FANS ARE USED ON ONLY ON BODYS WITH MODEL# MFU20F36W9
SINGLE FAN USED IN MODEL# FFU2064DW1



PARTS REPLACEMENT LIST

DESCRIPTION	PART NUMBER
ASS'Y, PCB, DISPLAY, 815	34395001
ASS'Y, PCB, 815 CPU	34381002
ASS'Y, PCB, PWR SUP, 815	34394901
ASS'Y, PCB, LIMIT / ALARM	34394601
ASS'Y, PCB, CHART RECORD	34393702
ASS'Y, RTD TEMP. PROBE, 100	34385102
SWITCH, ON/OFF	34240618
ASS'Y, CABLE, INTERFACE	34390302
FUSE KIT, 10 AMP, 115V	51245333
FUSE HOLDER KIT, 115V	51245331
FUSE HOLDER KIT, 230V	51245332
CORD W/PLUG, 115V	36353081
HARNESS, 815 BOD, 115V	34542631
CORD W/PLUG, 230V	34353046
HARNESS, 815 BOD, 230V	34542632
FUSE KIT, 5 AMP, 230V	51245334
RS232 COMMUNICATIONS OPTION	51200906
THERMAL CUTOFF SWITCH	34239193
STOPPER KIT	51245330
DOOR ASSEMBLY (1997 ⇒ 1999)	51245336
DOOR GASKET	34167350
MOTOR, FAN - DUAL REAR (MODEL #MFU20F36W9)	34223693
MOTOR, FAN - REAR (MODEL #FFU2064DW1)	81001527
AUTO TRANSFORMER	34225302
FREEZER FAN MOTOR	34278012
INS. TEMP. SENSOR BRACKET	34542619
BACK HARNESS	34542634
REAR COMPRESSOR COVER	34542649
REAR COMPRESSOR COVER (MODEL #FFU2064DW1)	36501019
COMPRESSOR (FOR MODEL FFU20F3AW0)	81001052
COMPRESSOR RUN CAPACITOR (FOR MODEL FFU20F3AW0)	81001053
MOTOR, INTERNAL FAN (FOR MODEL FFU20F3AW0)	81001054

WARRANTY

PRECISION warrants its products against defects in material and workmanship when used under appropriate conditions and in accordance with appropriate operating instructions for a period of no less than one (1) year from the date of delivery of the products.

Sole obligation of **PRECISION** shall be to repair or replace at our option, FOB factory or locally, without charge, any part(s) that prove defective within the warranty period, provided the customer notifies **PRECISION** promptly and in writing of any such defect. Compensation for labor by other than **PRECISION** employees will not be our obligation. Part(s) replacement does not constitute an extension of the original warranty period.

PRECISION MAKES NO WARRANTY OR MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, AS TO THE DESIGN, SALE, INSTALLATION, OR USE OF ITS PRODUCTS, AND SHALL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGE RESULTING FROM THE USE OF ITS PRODUCTS.

PRECISION will not assume responsibility for unauthorized repairs or failure as a result of unauthorized product modifications, or for repairs, replacement, or modification negligently or otherwise improperly made or performed by persons other than **PRECISION** employees or authorized representatives.

While our personnel are available to advise customers concerning general applications of all manufactured products, oral representations are not warranties with respect to particular application and should not be relied upon if inconsistent with product specification or the terms stated herein.

In any event, the terms and conditions contained in **PRECISION** formal sales contracts shall be controlling; and any changes must be in writing and signed by an authorized executive of **PRECISION .**

All defective components will be replaced without charge one (1) year from the date of delivery. There will be no charge for labor if the apparatus is returned to the factory prepaid.

Conditions and qualifications of the warranty statement shall prevail at all times.